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Erratum

Quantum Group Symmetry of the Hubbard Model

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The following paragraphs were accidentally omitted from E. Ahmed and A. S. Hegazi, International Journal of Theoretical Physics, 39, 1217–1219 (2000).

It is interesting to study the infinitesimally deformed fermionic oscillators and their possible relevance to high-temperature superconductivity. The deformed fermionic algebra is defined by

$$\left\{b_{i\sigma}^{\dagger}, b_{j\tau}\right\} = q^{N}\delta_{ij}\delta_{\sigma\tau}, \qquad \left[N, b_{i\sigma}^{\dagger}\right] = b_{i\sigma}^{\dagger}, \qquad [N, b_{j\tau}] = -b_{j\tau} \tag{12}$$

where $\{A, B\} = AB + BA$ and $[A, B] = AB - BA$. Let $q = 1 + \epsilon$ and lincarize in ϵ. One gets

$$N \simeq \sum_{\sigma}\left(b_{\sigma}^{\dagger} b_{\sigma}\right) + \epsilon b_{\uparrow}^{\dagger} b_{\downarrow}^{\dagger} b_{\downarrow} b_{\uparrow} \tag{13}$$

Since the Hamiltonian is typically proportional to the number operator N, it should contain a quartic term of the form (13). This term is quite similar to the one used by Anderson's group [3] to explain high-temperature superconductivity. Their Hamiltonian is

$$H = -\sum_{k} T(k)\left(b_{k\uparrow}^{(1)\dagger} b_{-k\downarrow}^{(1)\dagger} b_{-k\downarrow}^{(2)} b_{k\uparrow}^{(2)} + h.c.\right)$$

where (1) superscripts and (2) represent different CuO layers or O chains.

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